

Box Plots

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

A **box plot** (or box-and-whisker plot) shows data using five numbers: the **minimum**, Q_1 , the **median**, Q_3 , and the **maximum**. The **box** stretches from Q_1 to Q_3 and holds the middle half of the data; a line inside marks the median. The **whiskers** reach from the box out to the minimum and maximum. The width of the box is the **IQR** = $Q_3 - Q_1$, and the whole plot's width is the **range**. A box plot makes it easy to compare center and spread.

◇ **Example:** For the data 4, 6, 8, 10, 12, 14, 16, give the five-number summary.
 ⇒ The data is already in order, which makes this easier. The minimum is 4 and the maximum is 16. With 7 values, the median is the 4th one, 10. The lower half is 4, 6, 8, so Q_1 is its middle, 6. The upper half is 12, 14, 16, so $Q_3 = 14$. That gives the five-number summary: minimum 4, $Q_1 = 6$, median 10, $Q_3 = 14$, maximum 16.

Answer: 4, 6, 10, 14, 16

PRACTICE

Find the requested value from each data set or box plot summary.

- | | | | |
|---|-------|---|-------|
| 1. Median of 4, 6, 8, 10, 12, 14, 16 | _____ | 13. Same box plot: min 20, max 44. Find the range. | _____ |
| 2. Q_1 of 4, 6, 8, 10, 12, 14, 16 | _____ | 14. Same box plot: what value is the median? | _____ |
| 3. Q_3 of 4, 6, 8, 10, 12, 14, 16 | _____ | 15. Median of 20, 24, 28, 32, 36, 40, 44 | _____ |
| 4. IQR of 4, 6, 8, 10, 12, 14, 16 | _____ | 16. Q_1 of 20, 24, 28, 32, 36, 40, 44 | _____ |
| 5. Range of 4, 6, 8, 10, 12, 14, 16 | _____ | 17. Q_3 of 20, 24, 28, 32, 36, 40, 44 | _____ |
| 6. Minimum of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | 18. A box plot has $Q_1 = 6$ and $Q_3 = 18$. Find the IQR. | _____ |
| 7. Maximum of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | 19. A box plot has min 2 and max 22. Find the range. | _____ |
| 8. Median of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | 20. Range of 20, 24, 28, 32, 36, 40, 44 | _____ |
| 9. Q_1 of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | | |
| 10. Q_3 of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | | |
| 11. IQR of 5, 7, 9, 11, 13, 15, 17, 19 | _____ | | |
| 12. A box plot has min 20, $Q_1 = 24$, median 32, $Q_3 = 40$, max 44. Find the IQR. | _____ | | |

◆ Word Problems

21. The number of minutes 11 students practiced piano were 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22. Give the five-number summary.

22. A box plot of jump-rope counts shows minimum 5, $Q_1 = 8$, median 12, $Q_3 = 16$, maximum 19. What is the IQR, and what does it represent?

23. Two box plots compare quiz scores. Class X has median 32 and IQR = 16. Class Y has median 32 and IQR = 8. Which class has scores that are more spread out?

24. A box plot of plant heights shows minimum 20 cm, $Q_1 = 24$, median 32, $Q_3 = 40$, maximum 44. Between which two values do the middle half of the plants fall?



Answer Keys

- | | |
|--------|-----------------------------|
| 1. 10 | 13. 24 |
| 2. 6 | 14. 32 |
| 3. 14 | 15. 32 |
| 4. 8 | 16. 24 |
| 5. 12 | 17. 40 |
| 6. 5 | 18. 12 |
| 7. 19 | 19. 20 |
| 8. 12 | 20. 24 |
| 9. 8 | 21. 2, 6, 12, 18, 22 |
| 10. 16 | 22. IQR = 8 |
| 11. 8 | 23. Class X |
| 12. 16 | 24. between 24 cm and 40 cm |

Step-by-Step Explanations

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|---|---|
| <p>1. With 7 ordered values, the median is the 4th one: 10.</p> <p>2. The lower half is 4, 6, 8, and its middle value is 6.</p> <p>3. The upper half is 12, 14, 16, and its middle value is 14.</p> <p>4. $IQR = Q_3 - Q_1 = 14 - 6 = 8$.</p> <p>5. Maximum minus minimum: $16 - 4 = 12$.</p> <p>6. The smallest value listed is 5.</p> <p>7. The largest value listed is 19.</p> <p>8. With 8 values, average the 4th and 5th: $(11 + 13) \div 2 = 12$.</p> <p>9. The lower half is 5, 7, 9, 11; its median is $(7 + 9) \div 2 = 8$.</p> <p>10. The upper half is 13, 15, 17, 19; its median is $(15 + 17) \div 2 = 16$.</p> <p>11. $IQR = Q_3 - Q_1 = 16 - 8 = 8$.</p> <p>12. $IQR = Q_3 - Q_1 = 40 - 24 = 16$.</p> <p>13. Range is maximum minus minimum: $44 - 20 = 24$.</p> <p>14. The median is given directly in the five-number summary: 32.</p> <p>15. With 7 ordered values, the median is the 4th: 32.</p> | <p>16. The lower half is 20, 24, 28; its middle value is 24.</p> <p>17. The upper half is 36, 40, 44; its middle value is 40.</p> <p>18. $IQR = 18 - 6 = 12$ — the width of the box.</p> <p>19. Range is $22 - 2 = 20$.</p> <p>20. Maximum minus minimum: $44 - 20 = 24$.</p> <p>21. The minimum is 2 and the maximum is 22. With 11 values, the median is the 6th, 12. The lower half 2, 4, 6, 8, 10 has median $Q_1 = 6$, and the upper half 14, 16, 18, 20, 22 has median $Q_3 = 18$.</p> <p>22. $IQR = Q_3 - Q_1 = 16 - 8 = 8$. It represents the spread of the middle half of the jump-rope counts — the width of the box.</p> <p>23. Both classes have the same median, so we compare spread. Class X has the larger IQR ($16 > 8$), so its middle half of scores is more spread out.</p> <p>24. The box of a box plot stretches from Q_1 to Q_3, and that box holds the middle half of the data. So the middle half of the plants are between 24 cm and 40 cm.</p> |
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